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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

Date: May 23, 2005

In re application of: Douglas J. Zabawa, et al.
Filed: March 31, 2004.
Title: Attachment for a Bladed Rotor
Docket No.: EH-10469A
Serial No.: 10/814,066
Examiner: Dwayne J. White
Art Unit: 3745

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313

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APPLICANT'S APPEAL BRIEF

Sir:

This is an appeal by the Applicant from the final
rejection of the subject matter of claims 1 and 2 of the
above captioned application.

Real Party in Interest

United Technologies Corporation, of Hartford
Connecticut, a corporation of the State of Delaware.

Related Appeals and Interferences

There are no related appeals or interferences.

Status of Claims

Claims 1 and 2, the only claims in the application,
stand rejected and are the claims on appeal. Applicant

observes that page 2 of the Office Action mailed on May 4, 2005 refers to claims 10 and 21, not claims 1 and 2. This appears to be an inadvertent clerical error reflecting the fact that claims 1 and 2 were previously presented as claims 10 and 21 of parent application 10/123,453 filed on April 16, 2002 (now US patent 6,846,159).

Status of Amendments

No amendments have been filed subsequent to final rejection.

Summary of Claimed Subject Matter

Referring to FIG. 2, Applicant's invention relates to a blade, such as fan blade 40 for a turbine engine. The blade has an attachment 44, which is a portion of the blade that is normally trapped within a peripheral slot 16 on a rotor hub 12 in order to secure the blade to the hub. Referring to FIG. 10, the attachment has proximal and distal ends 88, 90. The distinction between the proximal and distal ends is discussed below. As seen in Fig. 12A, the blade of claim 1 has a rounded proximal end 88.

The subject matter of claim 2 is a bladed rotor comprising a hub 12 with a series of peripheral slots 16, and a set of blades 40 whose attachments 44 occupy the slots. Each blade attachment has a rounded proximal end 88.

The distinction between the proximal and distal ends of the blade attachment depends on the relationship between the attachment and an axial retention system, which is not an

element of the claimed invention. The axial retention system prevents the blades from sliding axially (i.e. in the slotwise direction) out of their slots. One example of an axial retention system includes a load transfer element such as snap ring 60 seen in FIGS. 4-6. The proximal end of the attachment is the end adjacent to the snap ring (claim 2) or intended to be adjacent to the snap ring (claim 1). See page 12, lines 19 - 22 of the specification.

The invention addresses the problem of safeguarding the integrity of a fan rotor in the event that one of the blades separates from the hub. Blade separation events, although rare, must be accounted for in the design of the engine. Although engine designers have devised effective ways to safely accommodate the separation of a single blade, it has proven inordinately difficult to accommodate the separation of two or more blades without introducing excessive weight, cost or complexity into the engine. Unfortunately, the separation of one blade can provoke the separation of its "following" neighbor, i.e. the neighboring blade that normally follows the now-separated blade in the direction of rotor rotation. Specifically, the separated blade collides with its following neighbor. As a result, the following blade experiences axially directed reaction forces. These forces can be severe enough to overwhelm the axial retention system and eject the following blade from its slot, thus provoking the multiple blade separation sought to be avoided. A more detailed discussion is found in paragraphs 0004 through 0008 of Applicant's specification.

Applicant has recognized that the geometry of the fan blade attachment can help regulate the transfer of forces to the axial retention system, thereby preventing separation of

the following blade. For example, the presence of a single or double chamfer feature 100, 100a, 100b (FIGS. 10-12) on the proximal end of the attachment can cause the attachment to plastically deform the snap ring rather than shearing through it. In the limit, the proximal end of the attachment is rounded rather than chamfered (FIG. 12A; page 16, lines 1-3). Paragraphs 0041 through 0048 describe the physical attributes and operation of the chamfered embodiment, but are pertinent because the rounded embodiment is a limit case of the chamfered embodiment.

Grounds of Rejection to be Reviewed on Appeal

The rejection to be reviewed on appeal is a rejection under 35 USC § 102(b) asserting that claims 1 and 2 are anticipated by US 4,417,854 (Cain et al.). The issue presented for appeal is the propriety of this rejection given that the reference does not expressly or inherently describe each and every element set forth in Applicant's rejected claims.

Argument

Rejections under 35 USC § 102(b)

Claims 1 and 2

The subject matter of claims 1 and 2 stands rejected under 35 USC § 102(b) as anticipated by US 4,417,854 (Cain et al.).

In rejecting the claims, the Examiner correctly observes that the attachment ("root flange" 14) of the reference blade has a rounded profile. The Examiner presumes that this profile extends from the proximal end of the attachment to the distal end and therefore concludes that the proximal end is rounded as recited in Applicant's claims 1 and 2.

Applicant respectfully disagrees with the Examiner's conclusion. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051,1053 (Fed. Cir, 1987). The reference fails this test for the reasons described below.

The reference does not disclose a blade with an attachment having a rounded end, proximal or otherwise. Rather, the rounded feature of the reference attachment is the cylindrical surface 18 facing the interior surfaces 20 of footing 22 (col. 2, lines 64-66). This cylindrical surface is analogous to the combination of Applicant's base

surface 50 (FIG. 9) and bearing surfaces 52 (FIGS. 9-12A) both of which are distinct from the end 88 of Applicant's attachment. In this regard, note that in Applicant's FIG. 12A, the lead line from numeral 88 clearly terminates on the end of the blade, not on the base or bearing surfaces.

The reference feature analogous to the end 88 of Applicant's blade attachment is the feature at the terminus of lead line 14 in the reference Figures. Because the reference is not concerned with this feature, it is not described. It is not even certain that this feature is the end of the attachment. It may be a cross-sectional view taken at an arbitrary plane between the ends of the attachment. Indeed, the cross hatching used in the illustrations would suggest that this is so. However even if the feature is the end of the attachment, and even if it's assumed to be the proximal end recited in Applicant's claims (as distinct from the distal end), its shape is not described in the text. And if the illustrations suggest anything, they suggest that the shape is flat, not rounded. Clearly, the cylindrical surface 18 illustrated in the reference is not the rounded proximal end recited in Applicant's claims 1 and 2. Accordingly, the reference fails to disclose Applicant's invention as required by 35 USC § 102(b).

Applicant acknowledges that during patent examination the pending claims are given their broadest reasonable interpretation consistent with the specification. The prosecution history of the parent application (10/123,453) suggests that the Examiner may be concerned that Applicant's words "proximal end is rounded" read on any rounded feature near one extremity of an attachment shown in a prior

reference. But this is an interpretation not consistent with the specification. As already noted, the specification and drawings distinguish end 88 from surfaces 50 and 52 (page 8, lines 29, 32; FIGS 9-12A). It is clear from Applicant's specification that the proximal end is the end surface 88.

It is therefore submitted that Applicant's claims 1 and 2 are patentable over the art of record. Reversal of the Examiner is therefore solicited.

Claims Appendix

The accompanying Claims Appendix contains a copy of the claims involved in the appeal.

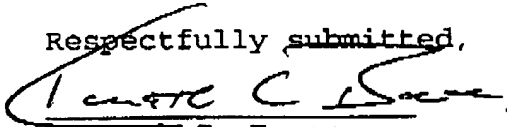
Evidence Appendix

An Evidence Appendix is not included because evidence as described in 37 CFR § 41.37(c)(1)(ix) has not been submitted.

Related Proceedings Appendix

A Related Proceedings Appendix is not included because there are no related proceedings as described in 37 CFR § 41.37(c)(1)(ii)

Respectfully submitted,


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CLAIMS APPENDIX

1. A blade for a bladed rotor, the blade having an attachment receivable in a slot of a rotor hub, the attachment having proximal and distal ends, the proximal end being rounded.

2. A bladed rotor, comprising:

a hub having a main body with peripheral slots; and
a plurality of blades each having an attachment occupying one of the slots, each attachment having proximal and distal ends, the proximal end of each blade attachment being rounded.